

Application No. 10/634,381
Response to Office Action

Customer No. 01933

R E M A R K S

Reconsideration of this application is respectfully requested.

RE: THE CLAIMS

Claims 2, 5, 8 and 13 have been canceled, without prejudice.

RE: THE DRAWINGS

In item 10 of the Office Action Summary on page 2 of the Office Action, the Examiner both accepted and objected to the drawings. However, since there was no objection to the drawings set forth in the body of the Office Action, it is assumed that the Examiner intended to accept the drawings. Confirmation that the drawings have been accepted is respectfully requested.

RE: THE SPECIFICATION

The Examiner objected to the specification based on the Examiner's assertion that the term "line image" is not clearly defined in the specification.

In the field of image engineering, a multivalued image having a smooth scale is commonly referred to as a "natural image" and a binary image is referred to as a "line image". That is, a "line image" is a binary or high-contrast image that

Application No. 10/634,381
Response to Office Action

Customer No. 01933

consists mainly of lines and letters, such as a blueprint of a machine or building.

Thus, for example, as described in the specification at page 8, line 27 to page 9, line 5, when using complementary printing as shown in Fig. 5B, "[w]hen image data is a natural image, the overlapped region 3A is beautifully printed. However, if image data is found to be a line image, the image printed by complementary printing cannot be linear (the image is zigzagged), so no clear line image can be printed (FIG. 5B)."

It is respectfully submitted, therefore, that the specification describes a line image as being made up of lines that should be linear, and that the specification contrasts a line image to a natural image by explaining that complementary printing is possible in a natural image (which is multivalued and has a smooth scale as described above), but yields unsatisfactory results for a line image (which is binary or high-contrast and made up of lines).

Accordingly, it is respectfully submitted that the term "line image" as used in the specification is understandable to one of ordinary skill in the art, and it is respectfully requested that the objection to the specification be withdrawn.

Application No. 10/634,381
Response to Office Action

Customer No. 01933

RE: THE PRIOR ART REJECTION

Claims 1-3 and 7-9 were rejected under 35 USC 102 as being anticipated by USP 6,474,765 ("Beauchamp"); claims 4-6 were rejected under 35 USC 103 as being obvious in view of the combination of Beauchamp and US 2003/0142161 ("Miura et al"); claims 10 and 11 were rejected under 35 USC 103 as being obvious in view of the combination of Beauchamp and USP 6,663,206 ("Taylor"); and claims 12-14 were rejected under 35 USC 103 as being obvious in view of the combination of Beauchamp and USP 6,332,665 ("Mantell et al"). These rejections, however, are respectfully traversed.

According to the present invention as recited in each of independent claims 1 and 3, an image forming apparatus is provided which comprises a recording head unit in which a plurality of recording heads are arranged in substantially the same direction as an arranging direction of recording elements such that an overlapped region is formed between the heads, and a detector detects a width of the overlapped region of each of the plurality of recording heads (claims 1 and 3) and/or a set angle of each of said plurality of recording heads (claim 3) from a predetermined test chart printed using the recording head unit.

According to claims 1 and 3, moreover, an image data distributor distributes image data input to each of the plurality

Application No. 10/634,381
Response to Office Action

Customer No. 01933

of recording heads, in accordance with the detected width of the overlapped region between the heads.

And according to claim 3, a driving timing correction unit corrects a driving timing of each recording element in accordance with the detected set angle when driving the recording elements of each of the plurality of recording heads.

The Examiner asserts on page 3 of the Office Action that the misalignment detection described at the top of column 7 of Beauchamp "refers to error in angle and overlap of the printhead." It is respectfully submitted, however, that Beauchamp makes no mention of "misalignment" with respect to overlap. And it is respectfully submitted that Beauchamp merely discloses identifying "global" and individual misalignments in angle as well as linear misalignments of the print heads 50, 52 and 54. In addition, Beauchamp discloses that, once identified, the misalignments can be compensated for by offsetting printed areas/segments printed by the respective print heads with respect to each other in the manner of lines 70 and 72 shown in Fig. 4.

With respect to overlap between the print heads, however, Beauchamp merely discloses that the print heads overlap when arrayed in a stationary array. And it is respectfully submitted that Beauchamp does not disclose, teach or suggest detecting an amount of overlap or distributing image data input to each of the plurality of recording heads, in accordance with the detected

Application No. 10/634,381
Response to Office Action

Customer No. 01933

width of the overlapped region between the heads, as according to the present invention as recited in independent claims 1 and 3.

As pointed out by the Examiner with respect to claims 4-6, moreover, Beauchamp discloses that at least a certain amount of misalignment can be compensated for, and Miura et al discloses displaying a message to instruct a user to replace a printhead. It is respectfully pointed out, however, that the message according to Miura et al is displayed when a print head suffers from discharge failure that is not corrected by a recovery operation, and it is respectfully pointed out that Beauchamp does not disclose that there is an amount of misalignment at which the printhead should be replaced.

It is respectfully submitted, therefore, that even if the teachings of Beauchamp and Miura et al were combinable in the manner suggested by the Examiner, the combination still does not disclose, teach or suggest instructing a user to replace or adjust the recording head if the detected width of the overlapped region of one of the plurality of recording heads exceeds a predetermined allowable range, as recited in claims 4-6.

Taylor has been cited for the disclosure of not performing complementary printing if the printed image is determined to be a line image. It is respectfully submitted, however, that the cited portion of Taylor merely relates to positioning a print head with respect to a recording medium such that when printing a

Application No. 10/634,381
Response to Office Action

Customer No. 01933

second swath at least one non-printing nozzle overlaps the last raster line of a previously printed first swath. And it is respectfully submitted that this feature of Taylor clearly does not correspond to distributing image data that no complementary printing is performed in the overlapped region, if the image data which corresponds to the overlapped region between the heads is determined to be a line image (i.e., a binary or high-contrast image that consists mainly of lines and letters).

In addition, it is respectfully submitted that while Taylor discloses shifting data in the print head to accurately eject ink to the recording medium to mask stitch joint errors, Taylor does not disclose, teach or suggest distributing image data input to each of a plurality of recording heads, in accordance with a detected width of the overlapped region between the heads.

Mantell et al, moreover, has merely been cited for the disclosure of recording head units to output different colors.

It is respectfully submitted that none of Miura et al, Taylor or Mantell et al discloses, teaches or suggests an image forming apparatus which comprises: (i) a recording head unit in which a plurality of recording heads are arranged in substantially the same direction as an arranging direction of recording elements such that an overlapped region is formed between the heads; (ii) a detector of the image forming apparatus which detects a width of the overlapped region of each of the

Application No. 10/634, 381
Response to Office Action

Customer No. 01933

plurality of recording heads from a predetermined test chart printed using the recording head unit; and (iii) an image data distributor which distributes image data input to each of the plurality of recording heads, in accordance with the detected width of the overlapped region between the heads, as recited in independent claim 1 and 3.

With this structure of the present invention, it is possible to perform accurate image formation while compensating for individually different, and fixed, widths of overlapping regions between fixed print heads.

In view of the foregoing, it is respectfully submitted that the present invention as recited in independent claims 1 and 3, and claims 4, 6, 7, 9-12 and 14 depending therefrom, clearly patentably distinguishes over Beauchamp, taken singly or in any combination with any of Miura et al, Taylor and Mantell et al, under 35 USC 102 as well as under 35 USC 103.

* * * * *

Entry of this Response, allowance of the claims and the passing of this application to issue are respectfully solicited.

If the Examiner has any comments, questions, objections or recommendations, the Examiner is invited to telephone the

Application No. 10/634,381
Response to Office Action

Customer No. 01933

undersigned at the telephone number given below for prompt
action.

Respectfully submitted,



Douglas Holtz
Reg. No. 33,902

Frishauf, Holtz, Goodman & Chick, P.C.
220 Fifth Avenue - 16th Floor
New York, New York 10001-7708
Tel. No. (212) 319-4900
Fax No. (212) 319-5101

DH:iv
encs.